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Liability Driven Investment and the role of Swaps

2004 Pensions Convention

Huw Williams
The Royal Bank of Scotland
8th June 2004

Liability Driven Investment and the role of Swaps

- Section One – Factors Influencing Asset Allocation
  - Background
  - Changing patterns in asset allocation
- Section Two – Traditional Ways of Matching Pension Scheme Liabilities
  - Development of the sterling debt markets
  - Limitations in physical inflation-linked assets
- Section Three – Overview of the Swaps Market and Applications
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  - Focus on inflation swaps
- Section Four – Implementing Risk Management Solutions
  - Liability Driven Investment – Overview
  - Case study
  - Legal and documentation
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- Summary

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Section 1

Factors Influencing Asset Allocation

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Factors Influencing Asset Allocation
Background

- Reduced scope for risk taking
  - Funding levels have reduced
  - Sponsoring companies downsizing and pension schemes maturing
  - Increased attention from Government, analysts, rating agencies, press…
  - Increasing focus on “insurance company buy-out solvency”
  - Changes in the accounting environment – FRS17, IAS19
- Pensions Bill
- Much greater focus on a “balanced” approach to investment – really a shift away from the equity risk premium towards a broader range of assets and investment objectives

Factors Influencing Asset Allocation
Trends in advice and practice

- Nature of fund management mandates is changing – becoming strategic as well as tactical
- Advisers widening the use of asset and liability modelling that traditionally concentrated on the equity/bond split.
  - Most have variants on the idea of a Liability Driven Benchmark or Risk Budgeting – large RPI or LPI component likely
  - Most advisors either promoting or receptive to picking up additional return through credit ideas and are keen to “get more out of bond portfolios”
  - Expecting a greater range of products to be used
- More corporate involvement to ensure that pension scheme risk management is consistent with overall balance sheet risk management.
- Impact on us is that our clients are becoming more sophisticated

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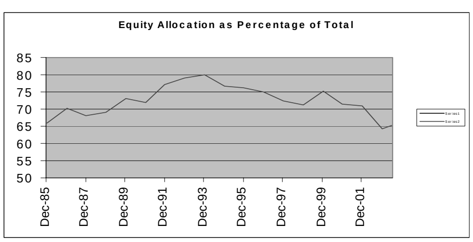
Factors Influencing Asset Allocation
What have these issues meant for asset allocation in practice?



Sources: WM Company All Funds Universe

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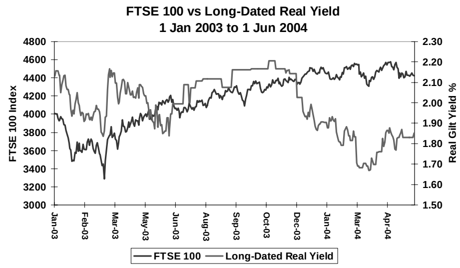
Factors Influencing Asset Allocation

So what's been happening to funding levels?



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Section 2

Traditional Ways of Matching Pension Scheme Liabilities

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Traditional Approaches to Matching/Risk Management

- Conventional and index linked gilts
- Latterly use of gilt strips has increased but severe size limitations and conventionals only
- More recently (since mid/late 1990s) greater use of corporate bonds
- UK and overseas assets hedged back into sterling
- Limitations in the physical market place (inflation and duration the main ones) has led to imprecise matching of assets to liabilities
  - Duration Management
  - Immunisation etc
- Lack of diversity and liquidity (particularly at the longer end) has imposed other constraints

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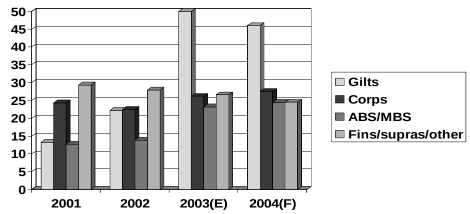
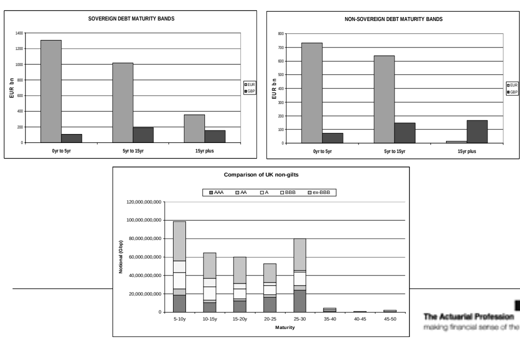
The Sterling Debt Market (£bn)

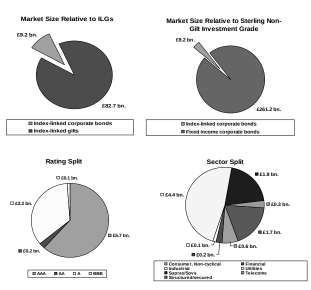


- Overall sterling debt supply has increased from £81bn in 2001 to £128bn in 2003, but will stabilise in 2004.

Structure of the Debt Markets in the UK and Europe



Sterling Index-Linked Corporates
A small, utility sector dominated market



Widening the Investment Universe
Example products and applications

- Strategic management
  - Primary bond issuance
  - Inflation derivatives to match inflation linked liabilities (RPI/LPI etc)
  - Interest rate swaps to match fixed liabilities
  - Interest rate options to hedge optionality in liabilities
  - Equity derivatives to provide capital protection or earn income (call-writing)
- Day to day management
  - Interest rate derivatives
  - Credit derivatives (e.g. CDS, CDOs, CSOs)
  - Asset swaps (e.g. overseas assets hedged back into Sterling)

Section 3

Overview of the Swaps Market and Applications

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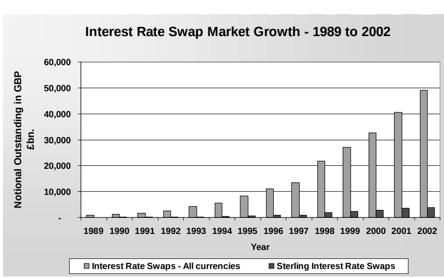
Interest Rate Swaps
Market growth



Sources: International Swaps & Derivatives Association and BIS

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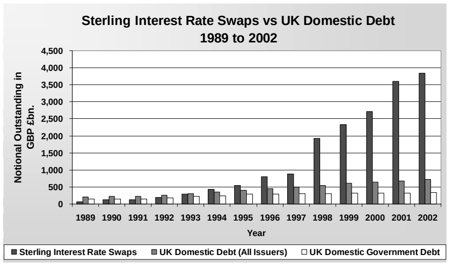
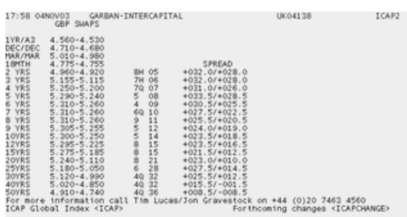
Interest Rate Swaps
Comparison with UK domestic debt



Sources: International Swaps & Derivatives Association, BIS, DMO

Interest Rate Swaps
Tenors

- Quotes available out to 50 years
- Reasonable liquidity out to 40 years



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17:58 04NOV03    GARBAN-INTERCAPITAL                 UK04138          ICAP2
            GBP SWAPS

1YR/A3    4.560-4.530
DEC/DEC   4.710-4.680
MAR/MAR   5.010-4.980
18MTH     4.775-4.755                     SPREAD
2 YRS     4.960-4.920     8H 05    +032.0/+028.0
3 YRS     5.155-5.115     7H 06    +032.0/+028.0
4 YRS     5.250-5.200     7Q 07    +031.0/+026.0
5 YRS     5.290-5.240     5  08    +033.5/+028.5
6 YRS     5.310-5.260     4  09    +030.5/+025.5
7 YRS     5.310-5.260     6Q 10    +027.5/+022.5
8 YRS     5.310-5.260     9  11    +025.5/+020.5
9 YRS     5.305-5.255     5  12    +024.0/+019.0
10YRS     5.300-5.250     5  14    +023.5/+018.5
12YRS     5.295-5.225     8  15    +023.5/+016.5
15YRS     5.275-5.185     8  15    +021.5/+012.5
20YRS     5.240-5.110     8  21    +023.0/+010.0
25YRS     5.180-5.050     6  28    +027.5/+014.5
30YRS     5.120-4.990     4Q 32    +025.5/+012.5
40YRS     5.020-4.850     4Q 32    +015.5/-001.5
50YRS     4.910-4.740     4Q 36    +008.5/-008.5
For more information call Tim Lucas/Jon Gravestock on +44 (0)20 7463 4560
ICAP Global Index <ICAP>                         Forthcoming changes <ICAPCHANGE>
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Source: Reuters

The Need For Inflation-Linked Assets

- Traditionally exposure gained through portfolios of index-linked gilts
- Trustees/consultants looking for:
  - Inflation-linked assets to more precisely match inflation-linked liabilities (e.g. LPI)
  - A yield pick-up through credit spread
  - Enhanced returns through active management
- Three inflation-linked asset solutions are becoming more common:
  - Inflation-linked corporate bonds.
  - Inflation swap overlays.
  - Index-linked gilts with credit derivatives.

Inflation Swap Overlays
The benefits of a inflation swap

- Using a swap overlay allows the Scheme to separate risk management (ALM) from investment management.
- The investment manager can be given a mandate in an asset class with both:
  - A higher expected return than index-linked gilts or conventional gilts.
  - A greater chance of adding value through active management because of a much wider opportunity set.
- The swap is then used to convert cashflows from this portfolio into cashflows that match the Scheme's liabilities.
- Can also be used in connection with gilts to refine the asset cash flows to more closely match the expected liability cash flows

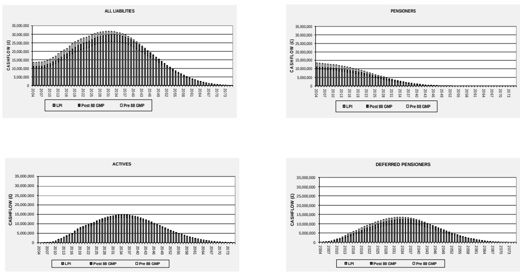
Section 4

Implementing Risk Management Solutions

Liability Driven Investment
Overview

- The aim of pension scheme assets is to meet promised benefits as they fall due.
- The pension benefits promised to date – the accrued liabilities – can be viewed as a stream of cash flows going out of the scheme over the next 80 or so years. These cashflows are illustrated overleaf for a typical pension scheme.
- To generate these cashflows we need to make several estimates and most critically,
  - The rate of future price inflation
  - Mortality rates
- If we were to invest in assets that provided the same cashflows and gave the same full or partial linkage to inflation, using our best estimate of mortality, then we would have reduced financial risk as much as possible.
  - The asset value would move precisely in line with the accrued liability value whatever happens to interest rates and inflation.

Example Liability Cashflow Graphs
Predominantly inflation-linked



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Liability Driven Investment
A Definition

- Liability Driven Investment can be thought of as the following approach:
  - i. Start by looking at liability cashflows
  - ii. Build an asset portfolio that would match these liability cashflows
  - iii. Move away from this “least risk” portfolio only if the potential rewards outweigh the additional risk.
- Risk budgeting can be used as a framework for deciding:
  1. How far away from the least risk portfolio should the scheme’s assets be?
  2. What risks should the scheme take – e.g. equity risk, interest rate risk, inflation risk?

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Liability Driven Investment
Past practice

- Why hasn’t such a simple idea been the standard practice for asset allocation in the UK pensions industry?
  1. Primary focus has been on choosing return enhancing assets such as equities.
  2. Performance benchmarks to measure the ability of investment managers.
     - These performance benchmarks have not necessarily been closely aligned with the actual underlying liabilities.
     - For example inflation-linked liabilities are often partially matched with assets with a performance benchmark of the FTA Over 5 Year Index-Linked Gilt Index. The difference in cashflows between the assets behind the index and some typical pension scheme liabilities is shown overleaf.
  3. The assets required for liability driven investment have not been readily available to UK pension schemes.
- However life insurers that sell annuities for personal pensions have followed this approach for many years.

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Liability Driven Investment
Developing practice

- Why is there far more focus on Liability Driven Investment now?
  1. The flexibility for risk taking has reduced over the last decade because of:
     - Lower funding levels
     - Maturing pension schemes
     - Increased attention from Government, analysts, rating agencies, press…
     - The focus on pension scheme solvency is increasing
     - Changes in the accounting environment – FRS17
     - Pensions Protection Fund – Premia to be based on risk factors from April 2006
  2. Advisors are widening the use of asset and liability modelling that traditionally concentrated on the equity/bond split
  3. More corporate involvement to ensure that pension scheme risk management is consistent with overall balance sheet risk management.
  4. Investment managers and advisors are looking to widen the search for value away from just the equity markets and are keen to use new techniques to “get more out of bond portfolios”.

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Liability Driven Investment
The applications of derivatives

- Derivative and banking methodologies can be used to identify and quantify the risks facing a pension scheme
- Valuation of liabilities
- Constructing the hedge portfolio (I.e. that portfolio which reduces or eliminates risk)
  - Either at a portfolio level;
  - Or to minimise specific individual risks (e.g. inflation, interest rate etc)
- Widening the range of investment opportunities
- Separating the liability management from the asset management using swaps
  - Facilitates portable alpha strategies
  - Synthetic asset creation
- Reducing transaction costs (e.g using swaps to help transition into credit)

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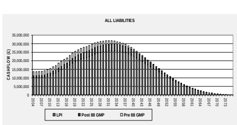
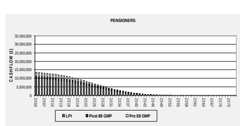
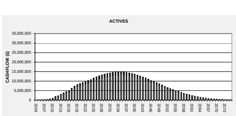
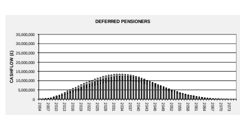
Case Study
Liability Cashflow Graphs









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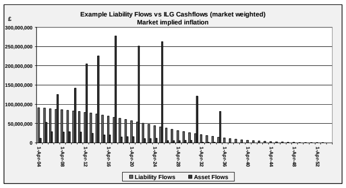
Pension Fund Cashflow Matching

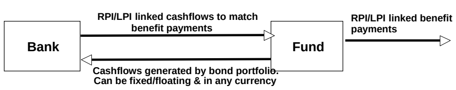
- Example: RPI-linked pension increases
- Match with inflation-linked assets but only an imprecise cashflow match possible with index-linked gilts and supply of inflation-linked corporate bonds insufficient.

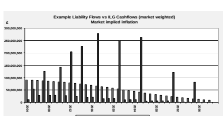


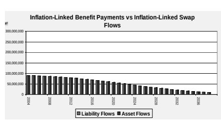
- Left with reinvestment risk/liquidity risk

Inflation Swap Overlay
Cashflow matching for pension funds

- An inflation swap can be used to exchange cashflows generated by a bond portfolio for RPI-linked or LPI-linked cashflows to match the precise nature and timing of pension payments.
- This gives a more precise inflation match than with index-linked gilts and allows freedom to invest in a wide range of underlying assets.



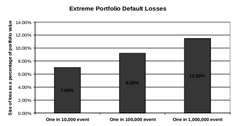


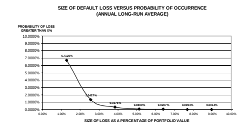


Yield Enhancement
Corporate bonds + RPI swap overlay

- Overleaf we give a portfolio of bonds for which the cashflows, based on current market prices, would provide the projected benefit payments for the next 33 years.
- The cost of this portfolio is £900m.
- This gives a saving of £100m over the cost of the index-linked gilt portfolio.
- The bond portfolio chosen is a diverse portfolio of investment grade bonds with an average A-rating.
- Based on historic default probabilities, we calculate that just over 1/5th of the saving would cover expected credit losses (but also need to consider unexpected losses).
- Larger savings are possible. In return the Scheme would need to accept the possibility of higher credit losses.
- In addition to the cost saving, the Scheme, via an RPI swap overlay to the corporate bond portfolio, would achieve closer management of its inflation risk.

Example Broad Investment Grade Portfolio	
Number of bonds	57
Portfolio Value	£900m
Credit Spread (duration w'td)	101
Average Mod. Dur	10.4
Average Default Probability	0.199%
Diversity Score	43





[1] Based on long-run average historic default loss rates from Moody's and S&P annual reports published in February 2003.

[2] The diversity score is an idea used by Moody's for rating portfolios. A lower number means less diversity so it is a useful statistic for comparing portfolios. A portfolio may contain many different bonds but these might be issued by the same company, companies with common parents or companies in closely related industry sectors. The diversity score reduces the number of bonds to a number of bonds that are independent (except for common reliance on the global macro-economic environment).

ISSUER	COUPON	MATURITY	VALUE	RATING
Lloyds TSB Bank PLC	6.63	30-Mar-15	10,290,106	AA-
BOC Group Plc	6.50	29-Jan-16	11,235,999	A
Aviva Plc	9.50	20-Jun-16	14,144,150	AA-
Aviva Plc	9.50	20-Jun-16	14,144,150	AA-
Smiths Group PLC	7.25	30-Jun-16	11,676,480	A-
Coca-Cola Enterprises Inc	6.50	7-Dec-16	11,414,127	A
British Telecommunications PLC	7.75	7-Dec-16	12,455,145	A-
Safeway Plc	6.00	10-Jan-17	9,757,781	BBB+
UPM-Kymmene Oyj	6.63	23-Jan-17	10,968,204	BBB
Northern Rock Plc	5.75	28-Feb-17	10,606,924	A-
Northumbrian Water Finance Plc	6.00	11-Oct-17	10,688,722	BBB
Japan Finance Corp for Municipal Enterprises	5.75	9-Aug-19	10,361,388	AA-
Bank of Scotland	6.38	16-Aug-19	11,749,455	AA-
GKN Plc	6.75	28-Oct-19	11,152,232	BBB
McDonald's Corp	6.38	3-Feb-20	10,849,527	A
Tussauds Finance Ltd	7.08	15-Mar-20	11,578,448	A
General Electric Capital Corp	6.25	29-Sep-20	11,464,344	AAA
AXA	7.13	15-Dec-20	11,535,899	BBB+
Enterprise Inns Plc	6.88	15-Feb-21	11,176,158	BBB
Norsk Hydro ASA	6.50	7-Jun-21	10,793,528	A
Coca-Cola Enterprises Inc	6.50	7-Jun-21	11,075,926	A
EGG Banking PLC	6.88	29-Dec-21	10,489,361	A-
Innogy Plc	8.13	9-Jun-22	12,007,357	A-
Annington Repackaging No 1 Ltd	5.32	10-Jan-23	10,048,878	AA-
Annington Finance No 4	8.07	10-Jan-23	11,753,029	BBB
3i Group Plc	6.88	9-Mar-23	11,628,523	A+
Highbury Finance NV	7.02	20-Mar-23	11,328,599	A-
Land Securities Plc	6.38	27-Feb-24	10,781,392	A-
THPA Finance Ltd	7.13	15-Mar-24	10,035,829	A
Unique Pub Finance Co Plc	7.40	30-Mar-24	11,871,898	BBB+
PowerGen U.K. PLC	6.25	29-Apr-24	10,920,646	A-
United Utilities Electricity PLC	8.88	25-Mar-26	14,633,263	A-
Citigroup Inc	5.15	21-May-26	9,894,166	AA-
GHG Finance Ltd	7.78	15-Jul-26	12,210,456	BBB
Aviva Plc	6.13	16-Nov-26	10,475,923	AA-
Canary Wharf Finance Plc	7.43	22-Oct-27	11,875,557	AA
United Utilities Water Plc	5.63	20-Dec-27	10,381,756	A-
HSBC Holdings Plc	5.75	20-Dec-27	10,859,364	A
BAA Plc	6.38	4-Aug-28	10,792,676	A+
Italy Government International Bond	6.00	4-Aug-28	11,217,067	AA
Tesco Plc	6.00	14-Dec-29	11,001,081	A+
Canary Wharf Finance II Plc	6.80	22-Apr-30	11,629,499	AA
RWE Finance BV	6.25	3-Jun-30	10,662,078	A+
Deutsche Telekom International Finance BV	7.63	15-Jun-30	12,460,191	BBB+
Electricite de France	5.88	18-Jul-31	10,331,396	AA
General Electric Capital Corp	5.63	16-Sep-31	10,712,488	AAA
Innogy Plc	7.13	1-Oct-31	11,680,575	A-
BAA Plc	5.75	10-Dec-31	10,132,652	A+
Legal & General Finance Plc	5.88	11-Dec-31	10,776,728	AA
J Sainsbury Plc	6.00	5-Apr-32	10,138,924	A-
McDonald's Corp	5.88	23-Apr-32	10,138,701	A
Equity Release Funding Plc	5.88	26-May-32	10,873,951	AAA
Schlumberger PLC	6.50	4-Oct-32	11,917,490	A+
Vodafone Group PLC	5.90	26-Nov-32	10,778,422	A
3i Group Plc	5.75	3-Dec-32	9,522,388	A+
Legal & General Finance Plc	5.88	5-Apr-33	10,729,260	AA
Trafford Centre Finance Ltd	6.50	28-Jul-33	11,913,727	AAA

Portable Alpha Strategies
Tactical investment management

Investment Manager Led Strategies

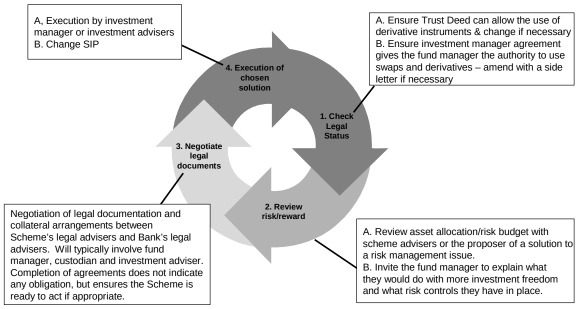
- **Trustees' Role:** Ensure bond managers have the freedom to explore all the opportunities available to them.
- **Why?** So that they are not at a disadvantage to other market participants such as insurance companies and banks who can choose between the best value prices in different markets

Yield Enhancement Technique	Instruments Required
1. Full range of credit ideas	• Corporate bonds – broad investment grade • Synthetic corporate bonds – CDOs, credit-linked notes & credit default swaps (these give the fund manager flexibility over the choice of names and maturities)
2. Efficient interest rate & inflation management relative to benchmark	• Interest rate swaps to manage interest rate risk efficiently • RPI & LPI swaps to manage inflation risk efficiently
3. Full range of currencies	• Cross currency swaps – these would allow, for example, the fund manager to invest in a "cheap" US dollar bond and swap the cashflows back to fixed sterling cashflows at a guaranteed exchange rate

Case Study Summary

- The Scheme's benefits are predominantly inflation-linked. Therefore inflation-linked assets would be an appropriate match for the liabilities.
- The physical assets that give the lowest risk relative to the liabilities are index-linked gilts. Trustees need to decide how much risk to take.
- An alternative asset and liability match would be to:
  - Buy a portfolio of fixed income corporate bonds.
  - Use the swaps market to convert the bond cashflows to the precise inflation-linked cashflows required to pay the Scheme's projected benefit payments.
- Relative to index-linked gilts this solution would:
  - Have a higher expected return – but additional credit risk
  - Provide more precise management of inflation risk
  - Remove reinvestment risk
  - Can be tailored to give protection against deflation or very low inflation.
- If tactical out-performance is sought then this can be achieved in a similar framework

Implementation Issues



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Legal and Documentation Issues

- Using swaps requires the pensions manager/trustees/consultants to:
  - Understand the nature of the contracts
  - Understand and complete documentation – ISDA and CSA for swaps
  - Understand and operate the collateralisation process (all deals to date have involved a zero threshold collateral agreement to mitigate counter-party risk)
  - Change the nature of the mandate appropriately
  - Ensure custodian is able to operate the collateral and swap processes
  - Obtain legal advice (potentially change the trust deed if required)

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Counterparty Credit Risk & Collateral

- OTC derivatives create counterparty credit exposure
- Exposure can be managed through a collateral process
- Counterparty who is out-of-the-money provides security in the form of collateral to the party who is in-the-money; similar to variation margin for exchange-traded contracts.
- Market standard International Swaps & Derivatives Association ("ISDA") documentation is used to support the collateral process in the form of a Credit Support Annex ("CSA") to an ISDA Master Agreement
- Collateral agreements becoming standard across all market participants.
- According to the ISDA Margin Survey 2003:
  - US$ 719bn of collateral in circulation
  - 38,500 agreements in place

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Summary

- Pension schemes are looking more closely at the bond and derivative markets
- This is both to improve the efficiency of existing portfolios and also to facilitate moves to a more matched investment strategy
- Recent Government proposals likely to encourage greater risk aversion (subject to moral hazard)
- Investment consultants changing their thinking and focusing much more on liabilities as a starting point

Q&A Session

Liability driven Investment and the role of Swaps

Huw Williams